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Leading With Data: Evidence From the National Center on Scaling up Effective Schools

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Through comparative case study, we seek to understand the ways in which actors in high schools use and think about performance data. In particular, we compare data use in higher and lower value-added schools. Data use is conceptualized here as having access to a host of available performance data on students, using them to guide instructional decisions, and building cultures in which data are seen as vehicles for improvements in practice. While our findings do not show consistent differences in the higher and lower value-added schools, they do allow us to set out an expanded conceptualization of school data use.

INTRODUCTION

Federal and state policies that reward or sanction schools for improving test scores present educators with significant incentives for using student performance data. In this environment, school leaders are using data to make instructional and resource decisions. Faculty are encouraged to “teach to the test” by aligning curricula and materials to the content and format of state tests (Au, 2007, 2008; Lyons & Algozzine, 2006). School leaders schedule to the test, reducing time allocated for lunch, recess, and some untested subjects (Jennings & Stark, 2006; Rentner et al., 2006). They also “staff to the test,” moving to tested grades teachers whose students make substantive learning gains (Cohen-Vogel, 2011). Despite the growing prevalence of data use in educational organizations, however, relatively little is known about whether

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and how the process of integrating data into practice differs between more and less effective schools.

The data for this article are drawn from a larger study of high school effectiveness by the National Center on Scaling up Effective Schools; this larger study focuses on eight components of school effectiveness ranging from quality instruction to personalized learning connections (Goldring, Porter, Murphy, Elliott, & Cravens, 2009). Here, we focus on findings related to one such component—data use in schools.

Through comparative case study, we seek to understand the ways in which educators in high schools use and think about performance data as they make decisions in increasingly complex schooling contexts. In particular, we are interested in comparing data use by schools that are growing students' performance with those that are not. We conducted this work in Florida, where accountability is relatively high stakes and performance data have been collected for over a dozen years. Specifically, we were guided by the following questions: What kinds of data are available to educators and how do they access these data? In what ways do teachers and administrators use data, and how do leaders work to build the capacity of their staffs to leverage data for instructional improvement? And, are there systematic differences in the ways educators in higher value-added and lower value-added schools access, use, and understand performance data?

To answer these questions, we begin by synthesizing the existing research to construct a comprehensive framework for understanding data use in schools. Our review suggests a trifold framework that includes the kinds of information that educators integrate into their practice, the ways in which they use that information, and the cultures they build to support data-driven practice. We describe the framework in the following section. We then discuss the data collection and analytic methods employed in our case study work and introduce the four schools in which data were collected. Finally, we present our findings.

FRAMING DATA USE IN EFFECTIVE HIGH SCHOOLS

Today's educators operate in information-rich environments in which numerous performance data exist that may inform decision-making and improve efforts to bolster student achievement (Anderson, Leithwood, & Strauss, 2010). In order to better understand the role of information in schooling, we construct a framework for systematic data use that emphasizes three key elements. First, educators in effective high schools have access to and use a wide variety of performance data; further, they are afforded easy access to such data through comprehensive information management systems. Second, personnel across organizational levels in effective schools use data for a diverse set of purposes; effective schools also develop the capacity

of their staffs to do so through focused professional development. Finally, the use of performance data in effective schools is increasingly mediated by strong, positive cultures of data use, in which educators work together to use available information for school improvement and collectively construct positive perceptions of the benefit and utility of data use in their practice. Each of these elements, when in place, supports the development of schools as effective and efficient “learning organizations.”

Data Access and Availability

Research supports the idea that a wide variety of performance data are available to school educators (Firestone & González, 2007; Guskey 2003; Halverson, Grigg, Prichett, & Thomas, 2007; Ingram, Louis, & Schroeder, 2004; Louis, Leithwood, Wahlstrom, & Anderson, 2010). Further, these data are derived from multiple sources. Teachers, school leaders, and support personnel may, for instance, have access to data from external sources, like state or district performance assessments. Firestone and González (2007) note that these data sources are “central to modern accountability initiatives”; indeed, the focal nature of such data sources within accountability structures may lend them substantial authority (p. 133). Additionally, as Anderson et al. (2010) note, such externally generated data may carry additional weight due to their perceived objectivity, validity, and reliability within the “academic test and measurement community” (p. 295).

Research (Black & Wiliam, 1998; Firestone & González, 2007) also indicates that internally generated performance data are pivotal to educators’ efforts to engage in diagnostic assessment of student learning, and in improving educational outcomes. Firestone and González (2007) identify both formal and informal manifestations of such data. They note, for instance, that informal sources like “teachers’ observational or anecdotal records” offer information that “can help adjust the delivery of instruction”; similarly, they argue, more formal data sources like “class projects, homework assignments, and end-of-unit tests all provide information about what students have learned” (p. 134). Black and Wiliam (1998) underscore the importance of internally generated, often informal, sources of data, asserting that it is “important to look at or listen carefully to the talk, the writing, and the actions through which pupils develop and display the state of their understanding . . . for this will initiate the interaction through which formative assessment aids learning” (p. 7).

Individual stakeholders may not, however, value internal and external performance data equally. Some research (e.g., Guskey, 2007; Ingram et al., 2004) indicates, for example, that teachers may question the validity of standardized assessments, constructing an environment in which “being dismissive of externally generated achievement data is a cultural trait that teachers learn and pass on to other teachers” (Ingram et al., 2004,

p. 1273). Other studies (e.g., Anderson et al., 2010; Cohen-Vogel, 2011; Cohen-Vogel, Osborne-Lampkin, & Houck, 2013; Cohen-Vogel & Rutledge, 2009; Guskey, 2007) suggest that district and school administrators are more open to utilizing externally derived data, primarily for evaluative and staffing purposes. Interviewing principals across a number of school contexts, Louis et al. (2010) finds that the majority report relying on “state- and district-mandated” measures of student achievement to inform a number of decisions—including those related to professional development.

In terms of data access, the literature also indicates that educators are accessing these diverse performance data through the use of increasingly complex information management systems (Cohen, 2003; Louis et al., 2010; Gallagher, Means, & Padilla, 2008). By and large, however, these systems are not uniform in their comprehensiveness, and may be limited in terms of the types of data they offer to practitioners (Gallagher et al., 2008; Means, Padilla, DeBarger, & Bakia, 2009). Cohen (2003) reports that recent efforts to expand access to state-level educational data are encouraging, and cites the Education Data Warehouse (EDW) movement as a prime example of how easy access to data may motivate educators to make wider use of available information. Petrides and Guiney (2002) support this, noting that the development of such one-stop-shops for data have ameliorated the issues caused by less efficient data systems, in which “departments and offices in schools maintain independent sources of data with these sources rarely related to each other” leading to “data redundancy and inaccuracies” (p. 7).

The Capacity for Data Use and Action

A number of researchers argue that developing capacity for data use among teachers is vital in establishing effective data-driven practice (e.g., Halverson et al., 2007; Kerr, Marsh, Ikemoto, Darilek, & Barney, 2006; Louis et al., 2010; Murnane, Sharkey, & Boudett, 2005; Wohlstetter, Datnow, & Park, 2008). Gallagher et al. (2008), for example, find that teachers who report high levels of confidence in their ability to use data and greater school support for professional development focused on data use are significantly more likely to report using performance data to communicate with parents, track student performance, identify skill gaps, and control instructional pacing (p. 20). Louis et al. (2010) find that, in schools exhibiting greater propensity for data use, “principals and teachers report increasing efforts to develop the capacity of teachers to engage collectively in data analysis for instructional decision making”; lower data use schools, conversely, report a strong reliance on external “experts” (p. 192). Further research (Gallagher et al., 2008; Means et al., 2009; Murnane et al., 2005; Sharkey & Murnane, 2003) suggests, however, that even as districts seem to be gradually improving support structures for data use, including professional development, many educators, particularly teachers in schools not meeting AYP, still feel unprepared

and undertrained to use data to engage in activities like interpreting test scores, adjusting the curriculum, developing diagnostic assessments, and interrogating data in meaningful ways.

Studies also show that educators translate their capacity to use data into practice in a variety of ways (Anagnostopoulos & Rutledge, 2007; Firestone & González, 2007; Lyons & Algozzine, 2006). Firestone and González (2007) construct a broad typology of data uses, asserting that within local organizations data serve to guide instructional actions, enlighten teachers and school leaders, and mobilize support for decisions. Examples of the first categorization, “guidance for action,” have recently been documented in the literature. Cohen-Vogel (2011), for instance, finds that school leaders in Florida report “using students’ scores on the state standardized exam . . . to make teacher staffing decisions”; she reports that “professional development, too, is planned with student assessment data in hand” (p. 499). Gallagher et al. (2008) find that teachers report using data to monitor student progress and communicate that progress to parents; they also find, however, that relatively fewer teachers report using data to identify skill gaps in students, change their curriculum, or modify their practices. Louis et al. (2010) support this, finding that the majority of principals and teachers in their study use data for “problem identification” rather than “problem solving.”

Few studies have, to date, shown linkages between data-driven practices and improved student achievement. Anderson et al. (2010) suggest, however, that current conceptions of data-based practice in schools may be construed too narrowly and that positive effects may be more likely as teachers, administrators and other school personnel begin to go “beyond the identification of problem areas to an investigation of the specific nature of and factors contributing to [problems]” (p. 321). Black and Wiliam’s (1998) review of research finds that, as teachers develop their capacity to use “formative,” internally-generated data to refine and improve their practice, they often produce “significant and often substantial learning gains” (p. 3). Further, they assert that teachers’ use of formative data to improve their practice “helps low achievers more than other students,” closing achievement gaps while improving overall achievement (Black & Wiliam, 1998, p. 3). They describe the state of such data use in schools as mired in a “poverty of practice,” however, and assert that many educators require significant development in their ability to leverage “formative” data in their work (p. 4).

Cultures of Data Use

Researchers on the vanguard of the field are pushing beyond simply discussing the development of systems and capacity for data-driven practice in schools, and are beginning to explore what we call here *the culture of data use* in educational organizations (Firestone & González, 2007; Ingram et al., 2004; Sutherland, 2004; Wohlstetter et al., 2008). As schools evolve into

“learning organizations,” administrators may cultivate a culture of data use in which teachers are trained to “see the value of data” and school leaders construct “explicit norms and expectations regarding data use” that “foster mutual accountability” (Wohlstetter et al., 2008, p. 247, 255). As Sutherland (2004) states, under such a positive culture of data use, making reflective and systematic decisions based on information becomes “the way we do things around here” and data changes from “something that is done *to* the school” to “something that is done *by* the school and *for* the school” (p. 289). Ultimately, such positive cultures of data use promote an atmosphere of “organizational learning,” in which emphasis is placed on “improved instruction, problem solving, and an investment in the long term that incorporates teachers’ and principals’ voices” (Firestone & González, 2007, p. 152).

Researchers also describe positive cultures of data use as highly collaborative in nature (Huffman & Kalnin, 2003; Petrides & Guiney, 2002; Sharkey & Murnane, 2003). Petrides and Guiney (2002), for instance, assert that collaborative data cultures embrace “communities of practice” in which educators construct knowledge ecologies that “weave together the actions of building a vision, stating the school’s mission, and engaging in reflective practice and inquiry” (p. 1710). Wohlstetter et al. (2008) find that in districts with positive cultures of data use, teachers “rely heavily on one another for support, new instructional strategies, and discussions about data”; they also assert that “structured time around data discussions was probably the most important scaffolding for continuous improvement” in the study schools (p. 253).

We conceptualize systematic data use, therefore, as a confluence of three parts: having access to a host of available data on students, using data to guide instructional actions and mobilize support for decisions, and building cultures in which data are seen as vehicles for improvements in practice. Using this framework, we conducted interviews and focus groups to understand data use in both higher and lower value-added schools. More specifically, we wanted to understand whether the schools participating in our study were operating in the kinds of diverse knowledge ecologies identified by existing research. We also sought to identify the ways in which various actors in our case study schools, both higher and lower value-added, utilized data in their practice and how their capacity to do so was developed. Finally, we sought to understand the ways in which participants in our case study schools worked together to build cultures of data use, and how those cultures mediated their use of data in improving student learning and performance.

METHODS

Case Study Schools

Working in Florida, we began by using a simple value-added achievement model (VAM) to estimate the relative performance of all of the state’s high

schools. Here, we were interested in comparing the practices of schools that were making gains with minority students, low-income students, and English Language Learners (ELL), in particular. The estimated fixed effect for each high school in the state was put in rank order and classified by deciles of value-added for these groups (see Sass, 2012). These analyses identified only one Florida district with multiple high- and low-value-added schools, according to our definition of school effectiveness. We partnered with this district for our work. The district has been engaged in a high school reform effort for the past nine years and achieved national recognition for its efforts to improve chronically low-performing schools. Despite these successes, the district had repeatedly failed to meet overall reading proficiency goals, as well as reading and mathematics proficiency goals for African American, economically disadvantaged and ELL-eligible students.

Four high schools in the district—two higher value-added and two lower value-added—were selected for case study using a ranked list from the VAM analysis (see Sass, 2012). From the list, we eliminated alternative, charter, and magnet high schools and then selected two higher and lower value-added schools for case study. With a strategy that balanced performance with demographic characteristics, we selected the two lowest ranked schools on math and reading gains with low-income, minority, and ELL students. We then selected the two highest ranked schools that had comparable student demographics.

Overall, the schools were relatively similar to one other on traditional demographic dimensions. They were all large (Florida has the largest schools, on average, in the nation), and had majority-minority student populations and average percentages of ELL for the district. School 102, one of the lower value-added schools, was slightly smaller than the others, with somewhat larger proportions of students qualifying for free or reduced-price lunch (FRPL) and ELL services.

The two lower value-added high schools in our study were 101 and 102. School 101 enrolled approximately 2,100–2300 students. In 2010, approximately 45–55% of those students qualified for FRPL; additionally, between 55–65% of the student body were identified as minorities. Five to ten percent of the school's students were classified as ELL in 2010. School 101's school grade, as defined by Florida's accountability framework, vacillated between an "A" and a "B" over the last three academic years.¹ During the 2010–2011 academic year, the school was classified as being in corrective status under the state's accountability system.

During the 2010–2011 school year, the second of our lower value-added schools, 102, had approximately 1800–2000 students. Sixty to seventy percent of those students qualified as FRPL. Sixty to sixty-five percent of the student body at 102 was of minority descent. Between ten and fifteen percent of the school's students were classified as ELL. School 102's school grade shifted between a "D" and a "C" over the last several years, and it was placed in corrective status by the state's DA system in 2010.

TABLE 1 Demographic Profile of Case Study Schools, 2010–2011.

School	Enrollment	% FRPL	%	% ELL
101	2100–2300	45–55	55–65	5–10
102	1800–2000	60–70	55–65	10–15
103	2200–2400	45–55	65–75	5–10
104	2800–3000	30–40	50–60	5–10
District average	2327	52	73	9

Note. Schools 103 and 104 were identified as higher value-added using our value-added model; schools 101 and 102 are lower value-added. To ensure confidentiality, school names are pseudonyms, and demographic values have been converted to ranges. Demographic data were derived from the School Public Accountability Reports (SPAR) compiled by the Florida Department of Education. FRPL = Free and Reduced Price Lunch; Minority African American, Hispanic, Asian, & Other; ELL = English Language Learners. District averages were calculated with data from all non-alternative, non-charter public high schools in the district ($N = 29$).

The first of our higher value-added case study schools, 103,² had approximately 2200–2400 students in 2010 (see Table 1). Between 45–55% of those students qualified for FRPL. The student body was predominantly comprised of students of minority descent, who accounted for 65–75% of the school's enrollment. School 103's school grade was an "A" for the last several years; additionally, the schools' relatively high performance resulted in its assignment to a category in the state's differentiated accountability (DA) system with less oversight and monitoring than other schools in the study. One element that differentiated 103 from the other schools in the study was its system of admission—students matriculated to 103 through a "lottery" system. Like many large, urban districts, the sampled district offered a variety of choice options from magnets to charters to schools within schools. While there were no performance criteria on which applicants were evaluated at 103, and the school was required to maintain a demographic makeup consistent with the wider district, there was an element of "choice" to 103's admissions process not present at the other sampled schools.

Finally, the second of our higher value-added schools, 104, served between 2800–3000 students in 2010. Thirty to forty percent of those students qualified for FRPL. Students of minority descent comprised 50–60% of the student body. Between five and ten percent of the school's students were classified as ELL. School 104's school grade was a "B" over the last three academic years and the school was in corrective status in 2010, as determined by the state of Florida's DA system.

Data

Data analyzed in this study were collected from our four case study schools during three week-long visits in the 2010–2011 school year. In total, these data represented 120 participant interactions across the four schools, and provided a broad perspective of the perceptions and reported practices of educators, across organizational levels of each school, related to data analysis

TABLE 2 Data Sources by School.

Interaction Type	School 101	School 102	School 103	School 104
Interviews				
Principals	2	2	2	2
Assistant principals	4	5	4	4
Guidance counselors	2	2	2	2
Support personnel	2	2	2	2
Department heads	4	4	4	3
Teachers	9	9	9	9
Students	3	3	3	3
Focus groups				
Teachers	2	2	2	2
Students	2	2	2	2
Total	30	31	30	29

and decision making. Specifically, we drew on data from 104 semi-structured interviews and 8 focus groups with teachers or students (see Table 2). We worked with principals and guidance counselors on question development and piloted the protocols with teachers and administrators in a second district before data collection began.

In each school, interviews were conducted with the principal, assistant principals, guidance counselors, support personnel (e.g. lead instructional coordinators and ELL coordinators), students, and department heads and teachers of mathematics, science, and English language arts. With regard to data use, we asked participants about the roles that data play in their practice, and included items for teachers, for example, such as “How do you use data in your classroom?”

Our work was iterative. Throughout the data collection process, we interrogated the data in order to identify emerging concepts and avenues for further inquiry. This work was facilitated through the use of Post-Interaction Forms (PIFs), which prompted us to consider the ways in which participant’s responses supported or refuted the essential components framework and to identify emerging concepts or issues with the data collection process (see discussion of post-field reflection activities in Miles & Huberman, 1994). Further, on a twice-weekly basis during the fieldwork, the three members of an individual school teams met and used their PIFs to prepare a school report synthesizing their collective work. After each full field visit, school teams took these fieldnotes and worked together across schools to compile preliminary findings, revise interview or focus group protocols, and design further data collection activities.

Analysis

Following this iterative process of data collection and preliminary analysis, we began systematically analyzing data through directed content analysis

(Patton, 2002). We started by analyzing the data categorically, first assigning basic, descriptive codes for *data availability and access*, *data capacity and use*, and/or *culture of data use*, to reflect the three component parts of our conceptual model. Within each component category, we allowed themes to emerge from the data inductively (Miles & Huberman, 1994). In so doing, we cataloged the various data types as *internal* and *external* and *informal* and *formal*, and the uses of data for *staffing decisions*, *instructional adaptation*, and *needs identification*, among others. Basic codes identifying *cultures of data use* were similarly expanded, to include secondary codes like *data use as a schoolwide norm* and *collaborative analysis and use*.

In addition to this descriptive coding, we also engaged in summative content analysis of the interview and focus group data (Hsieh & Shannon, 2005). As part of this analytic process, rubrics were constructed which researchers used to assign numeric scores for the intensity or frequency with which certain elements of systematic data use were reported by our participants. The rubric elements evaluated by coders were developed collaboratively by the analysts and included: the *diversity of demonstrated use* (based upon the number of discrete uses for data identified by the respondent), the *frequency of demonstrated use*, *perceptions of the culture of data analysis and use* (rating the positivity or negativity of the respondents' expressed perception of the use of data in their school), and the *frequency of collaborative data analysis and use*. Mean scores across these rubric categories were computed and compared using independent samples T-tests to compare higher- and lower-value-added schools.

Two people coded the data to promote reliability in the coding process. During the initial phase of analysis, the coding pair analyzed and scored the same transcripts on the basic, descriptive codes, noting possible codes for the second level of analysis. Additionally, coders sought out and identified disconfirming evidence—what Corbin and Strauss (2008) term “cases that don't fit the pattern” (p. 298). The coding pair met frequently to share and test these emergent codes, work through coding inconsistencies, refine the coding framework and rubrics, and build reliability. Once inter-rater reliability was established, analysts coded the data. During this second phase, the coding team continued to meet to discuss potential issues in the coding process, additional emergent codes, and any disconfirming evidence. In the case of negative or disconfirming evidence, the team worked collaboratively to revise their coding framework—either modifying construct definitions or eliminating constructs when appropriate. Additionally, the coding pair wrote two types of memos during the coding process—an in-depth annotated memo, citing coded evidence and rubric scores to describe findings at each school and noting negative cases in the data, and summary memos that identified similarities and differences across cases and the policies, programs, and practices related to data use at each school. As we describe in the findings section, these procedures led to the extension of our guiding

framework by Firestone and González (2007), and, specifically, allowed us to identify two manifestations of schools use of *data to guide action*.

SYSTEMATIC USE OF DATA: FINDINGS FROM FOUR CASE-STUDY SCHOOLS

For the most part, we found more commonalities than differences between data use by the higher and lower value-added schools. There were some differences, however, between three schools and the fourth, whose performance put it in an advanced improvement status, subjecting it to state and district oversight and regular visits by the district area supervisor and state institutional response teams. We present findings for the three components of our framework each in turn.

DATA AVAILABILITY AND ACCESS

Participants across all four case-study schools reported that they are surrounded by performance data from numerous sources. Administrators, teachers, and support personnel alike indicated that they have ready access to externally derived data like AP scores, scores on the Florida Comprehensive Assessment Test (FCAT), and scores on district benchmark tests. A department head at 101, for example, highlighted the role of these data in her practice, sharing that “I think we are primarily driven by FCAT data for everything in the school. FCAT data, and of course . . . we have to look at pass rates [on the AP exam] for each course.” Internally derived information—like student grades, attendance data, teachers’ formative perceptions of student performance, and information from casual observations and conversation—also reportedly played a significant role in educators’ work across all four institutions. School 103’s principal, for example, shared that he always finds time to talk with students to gauge the health of the school, asserting that

I can find out what’s going on in the classroom just by walking around in the cafeteria . . . I will have a kid come up to me in the cafeteria and I say “Why aren’t you in class?” “What class are you in?” “Um, chemistry.” “Your teacher let you out? There is like 35 minutes left in the period!” “Yeah, she said I could leave . . . I was done.” That tells me that the teacher doesn’t teach bell to bell.

Participants in all four schools reported that they accessed these data through two primary gateways to the district’s data “warehouse.” The first, Virtual Counselor, is an online data system offering principals and teachers access to a wide variety of information, including students’ attendance

records, academic history, schedules, and test scores. The second, Pinnacle, offers online access for students and parents to information on students' progress on course assignments and grades. One teacher in 103 detailed the comprehensive nature of Virtual Counselor, sharing that the system is

a resource website, where it shows the credits the student has taken, the track they are on, their grades in every class. You can look up FCAT data on Virtual Counselor. You can look at their schedule. You can look up every test they have had. It's like a counselor on computer. All of the records on that child for everything.

Typical of comments across the schools, a student shared that Pinnacle is her parent's primary school monitoring tool:

My mom, she set up this thing with Pinnacle that it like updates her every five minutes, and she always goes on. If the teacher puts in an early grade [for a student], like before the rest of us turn it in, [my mom] will say, "Why didn't you hand it in?" I am like, "We didn't hand it in yet!" She stays on top of things to keep me on top of things.

Participants in 104 reported that their access to both internally and externally derived data is enhanced through a third system, in addition to Virtual Counselor and Pinnacle, developed within the school itself. The system incorporates scores on a series of formative assessments—derived from the district's benchmark tests—into the wider pool of data provided by other systems.

In general, the relative value placed on these types of data was also fairly consistent across schools. Educators, on the whole, adopted a balanced approach to selecting from available information in their day-to-day decisions. Consistent with prior research, however, teachers in all four schools expressed a greater reliance on, and trust in, internally generated performance data, like teacher-developed assessments, students' grades, and informal feedback from students, than did their administrators (e.g., Guskey, 2007; Ingram et al., 2004). A teacher in 101 summarized this perspective, asserting that, while externally derived data "helps to understand," "that's not who those kids are. They are living, breathing things. They are people. They have feelings and emotions." This perceptual divide was reportedly much more pronounced in 102, with a number of participants asserting that the views of the faculty differed sharply from the administration, particularly the principal, regarding the relative emphasis that should be placed on differing types of data. One teacher in the school expressed frustration with the principal's focus on externally derived data, asserting that "all he talks about is numbers. The kids to him mean numbers. I guess for him all he wants is to keep his job and make sure . . . we meet AYP, so he looks good. I think that's all he wants, honestly."

On the whole, we found few systematic differences regarding the ways participants in our four case study schools access data, or the nature of the data that is available to them. In both higher and lower value-added schools, participants reported that they are immersed in information-rich environments, and that the data available to them includes externally derived data like standardized test scores and internally derived data like classroom assessments. They also reported accessing data through the same information management systems. While many teachers reported holding a greater trust in internally derived data—especially in 102, one of the lower value-added schools—school actors as a whole seem to have adopted a balanced approach to selecting from available information.

Data Use and Capacity for Action

Participants across all four case-study schools reported that their use of data largely falls within what Firestone and González (2007) termed “guidance for action.” Based on the data gathered in our case study schools, we extended the Firestone and González framework here by categorizing guidance for action into two subconstructs—wherein schools used data to *guide the structure of the learning environment*, and to *inform the instruction of students*.

In all four schools, participants said that performance data—particularly, externally derived data—play a key role in structuring the learning environment by informing decisions regarding student placement. This is largely enabled by a district-created “assignment matrix” that uses student course grades and scores on the FCAT to assign students to courses—AP, Honors, Regular, and Remedial. An assistant principal in 103 described the process this way:

Each student is assigned [to courses] based on their performance. We believe it's important to have an appropriate match of curriculum to the student's ability. So students who have the ability to take Advanced Placement classes will be enrolled in Advanced Placement classes or Honors classes and so forth. If a student shows a deficiency, whether it be in math or reading or writing, then they will be enrolled in a class to help conquer that deficiency and increase their achievement. So all assignments are based on the student data.

Also related to the structure of the learning environment, participants' reports in three of the four schools—101, 102, and 103—suggested that data are used to assign teachers to grade levels and tracks. An assistant principal in 101, for example, shared that the process of assigning teachers to courses revolves around questions like: “Based on the data, tell us, do you think teacher X is okay to handle the Algebra classes next year?” ‘Let's look at his or her learning gains for the students, and see if that's a good fit or not.’

Most of our teachers are placed into classes accordingly.” The principal of 102 offered a similar example:

For the last three years, I have looked at my writing teachers’ scores on the FCAT, and I have some teachers that are just like consistently in the 70, 80 percent of 3.5s and 4s. Then over the last few years, I have had teachers that were not. So I made some really conscious decisions. I took a couple of people out of 10th grade writing, meaning the 10th grade English teachers, and I put some other people in. I had one person that only had one section [of 10th grade English], but she had great scores. So the next year she had all of 10th grade [a tested grade].

Participants across all four schools also reported that data guide their instructional efforts. Instructional efforts are expressed in two dominant forms: the targeting of certain students for instructional intervention and the modification of classroom practice. By and large, participants were much more likely to report that data—both externally derived assessment data and formal, internally derived data like grades or benchmark tests—are used to target groups of students for intervention or additional services than to report using them for instructional modification. Numerous participants in all four schools, for example, reported that they use data to identify students in the “bottom 30%” for “pull-out” courses or Saturday FCAT Camps.

A department head in 103 offered another example of “targeting” students for instructional intervention:

After spring break, we are going to have our “crunch time tutoring” for our level-three students. Students that have just made FCAT level three. Our concern is that sometimes these kids fall back because they don’t have a reading class, so those students—it’s about 170 of them, 9th and 10th graders—they are going to get pulled from their elective class starting when we come back from spring break, and I will be tutoring them up to the test.

On the whole, participants in all four schools reported that they use performance data—both externally and internally generated—to modify classroom instruction far less frequently than they use it to “target” or identify student groups. Participants in 103, one of the higher value-added schools, reported one of the few cases of systemic instructional adaptation based on data. Members of the administration there indicated that scores from the district’s benchmark assessments are used to tailor schoolwide “do-now” activities aimed at specific deficiencies in student performance. Several teachers, across all four case-study schools, indicated that they used internally generated, often informal, data to guide instructional decisions—generally regarding instructional pacing or targeting areas of deficiency. A teacher in

102, for example, shared that “from a writing prompt, on the first day of school, I can tell already [there’s] no need [for] working with subject-verb agreement. These kids got it. What do they need? . . . I base it on what I see from the kids.” Participants did not, however, indicate that there was a systematic effort to incorporate such data into decision making across their schools, framing the practice as a largely individual effort.

In addition to the purposes for which data are being used, researchers were interested in the ways schools are working to build capacity for data use. Participants in three of the four schools—101, 103, and 104—reported that there are systematic supports in place to build educators’ capacity to make use of performance data in their practice. Participants at 102, on the other hand, reported that such efforts to develop the capacity of all school actors to use data are highly infrequent and not systemic.

In 103, efforts to build data-use capacity are enacted through “data chats” at the beginning of the year, in which an assistant principal, counselor, and teachers from across academic departments meet to collectively analyze data. A department head at the school described the activity as follows:

We were with the reading department, and, I believe, the foreign language department. We were all in one room with two guidance counselors and we went through our data. We had to fill out these sheets that basically told us which strands or benchmarks the kids were lowest in. What were your lowest, medium, and highest [strands], so that we could formulate a plan the very first day of school.

Participants in 101 reported that they engage in a similar process. The school’s principal shared that

We have chats with the teachers during their planning periods. We talk about three things every three weeks. [At] our most recent one, we talked about identifying students that are in your lowest quartile when you look at the data. And, subgroups—identifying who are those kids, where are we with them, and what’s your approach in teaching them. And, looking through the lesson planning piece. Our next chat focuses on what are you doing with those kids, give me specific best practices that you are doing to share among the staff.

In 104, participants reported that capacity development centers on students’ performance and is a responsibility of the recently formed instructional leadership team. The instructional leadership team uses the data to identify teachers with whom they may work to help identify student deficiency areas and model instruction.

Participants at 102, by and large, did not report that there are systematic efforts to develop the capacity of the school staff to use data to inform their practice. One assistant principal indicated that he is trying to build up his

teachers’ ability to use data, and that they “work a lot on data and being able to break down what’s going on.” He also indicated, however, that the opportunities available to do so are “not enough” and not schoolwide.

Overall, our findings did not indicate that systematic differences exist in the ways educators in the higher and lower value-added schools in the study use data to guide and inform their practice. In all four of our case-study schools, participants indicated that data play a variety of roles in their work, providing valuable information used to structure the learning environment and, to a lesser extent, instruct their students. Analysis of the rubric scores supported findings from the qualitative coding described throughout this section (see Table 3). In comparing mean rubric scores for participants’ use of data, we found no significant differences between higher and lower value-added schools for either what participants use data for (*diversity of use* in Table 3) or how often they use them (*frequency of use*). Moreover, in both of our higher value-added and one of our lower value-added schools, study participants reported that there are systematic efforts to build the capacity of the instructional staff to use data in their practice. One school did stand out, however. According to participants at 102, there are few efforts to develop the faculty’s capacity for data use.

Cultures of Data Use

The extent to which our case-study schools have developed strong and positive cultures of data use seems to vary across schools. Participants in 103 reported the “strongest” culture, indicating that they tend to view data as a beneficial part of their practice. One teacher in the school, for example, enthusiastically reported that “It’s everything. Data drives everything . . . That’s the basis for everything I do.”

Participants in 101 and 104 expressed somewhat mixed perceptions of the benefit and utility of data use, and indicated that data cultures are still growing and evolving in their organizations. Several teachers in 101, for

TABLE 3 Mean Scores on Rubric Dimensions by School.

Dimension	School 101	School 102	School 103	School 104	HVA/LVA Difference
Data use and capacity for action					
Frequency of use	2.19	2.10	2.23	2.44	No
Diversity of use	2.11	2.10	2.14	1.96	No
Cultures of data use					
Perception	2.05	1.48	2.42	2.09	Yes
Frequency of collaboration	2.18	1.85	1.67	2.13	No

Note. Schools 103 and 104 were identified as “higher value added” using our value-added model. The HVA/LVA Difference column indicates whether mean differences between higher value-added schools and lower value-added schools are significant at the $p \leq .05$ level.

example, reported that they are required to use data, and generally view it as necessary; some also indicated, however, that they do not hold a positive perception of how data is being used in the school:

We have to look at the kids who are low performing. How do we take this particular group of kids, and how do we move them to the next level? What do we do with it? I don't think we use data effectively. I think for the most part we collect it. We look at it. We talk about it and that's it.

Educators in 104 reported similar perceptions. One teacher, for instance, said “I am going to be frank here. The jumping through hoops to meet certain requirements of testing, and meetings about your lowest quartile and your AYP—I mean, sometimes I feel like if they would leave us alone and let us teach we would be okay.” Another was more positive, asserting that: “When I see my kids, I could tell you off the top of my head what they are weak in . . . [for example,] informational text. So, I think that has been a tremendous, positive change. Knowing where your students are, where their weaknesses are, where their strengths are.”

102's culture of data use stands in sharp contrast to the cultures in our other case-study schools. Teachers in the school expressed generally negative perceptions regarding data-driven practice. The negative culture seems to be driven by a strong emphasis on accountability and a practice of “shaming” teachers with data. Teachers reported feeling extremely anxious about the results of external performance measures, sharing that “When I get the scores still, it takes my breath away. It makes me feel very worried, anxious about what's going on.” Others expressed frustration. They perceive that the accountability system is based on one-sided or invalid data. According to one teacher, for example, “They don't even look at the data. Not your data. The data that they collect . . . all this home-grown data, they haven't looked at that.” Another teacher agreed:

Every week or so there is pre- and post-assessments, and then there is training and another round of testing. They want me to look at this data and plan my instruction around it and I can't. The data isn't valid. I know what my kids' issues are. I see it in the work they turn in. That's where my instruction needs to take place.

At 102, underperforming teachers are also reportedly “named and shamed.” Here, students' scores on the state assessment are linked with teachers' names and shared publicly with other teachers in the school. According to one teacher in the school: “My data is published at the end of the year. It's made public. I mean that in a loose sense. Not to the whole community, but other teachers can see what kind of learning gains did [I] get last year.” Another teacher reported that data

end up around the whole school. I am not in [another teacher's] department, but I know what percentage he has, and I know his score. It was pointed out: "Should we do what we normally do and hide the names?" [The principal replied,] "No, leave it like that. I want everybody to see the names." That was a decision that was made, and I can only think it was to embarrass people into doing better.

In considering data-use cultures, researchers were also interested in collaborations among teachers and other staff members in schools. In all four sampled schools, participants reported that there are structures in place to encourage *collaborative* analysis and use of performance data. These largely center on "data chats" between administrators and teachers. Small Learning Communities and Professional Learning Communities were also named as venues in which teachers use data collaboratively. The frequency with which actors engage in collaborative data use, and the benefit they perceive in doing so, varies between schools, however. Participants in 101, for instance, reported that teachers and administrators collaboratively engage with data on a frequent basis—about every three weeks. Some participants in the school, however, reported that they feel these activities are less than useful. One, for instance, said that

We have data chats, which can get a little frustrating . . . Sometimes you sit in a meeting for an hour. It gets around to your turn so you talk for five minutes about what you did in your class that day, or whatever, and in the mean time, to be quite honest, in your mind you are like, "I could have graded a whole stack of papers."

Participants in 103 and 104 reported that they engage in collaborative data use on a more infrequent basis—a few times per year in 103, for instance—but that these activities tend to be productive and focused on instructional practice. Reports at 102 stood in relative contrast to the other schools. While "data chats" were cited as an avenue for collaboration around data, participants said they occur infrequently and serve to bolster an already negative climate.

As with the two other elements of the framework, there do not appear to be consistent and systematic differences between our higher and lower value-added schools in terms of data cultures. In three of the four schools, participants indicated that they operate in functional cultures of data use. While participants in 103 reported a more generally positive perception of the benefit and utility of data in their practice, those in 104 and 101 seemed to merely accept data-driven practice as the new norm. Similarly, participants in all four case-study schools indicated that there are structures in place that serve to support the collaborative analysis and use of available performance data. Once again, however, 102 stands out from the other case-study schools.

Relative to the other three schools, participants there reported that the culture of data use in which they operate is significantly more negative and focused on shaming, and that they often question the benefit, utility, and even validity of data-driven practice in their school. Comparisons of the mean rubric scores for participants' perception of the benefit and utility of data use does indicate that there is a significant difference between the higher and lower value-added schools in our study (see Table 4). But, as Table 4 shows, and the responses reported above reflect, this appears to be driven by higher scores in 103 and lower scores in 102.

DISCUSSION AND CONCLUSION

Without exception, participants in all four schools reported that they had easy access to a comprehensive pool of performance data. They also reported using data in similar ways, ways that we grouped into two categories: to guide the structure of the learning environment and to guide instruction. According to participants, all four schools also employed some structures by which data were analyzed and used collaboratively through data chats, for example, although the nature of these collaborations appear to have differed somewhat between schools (see Table 4 for a summary of findings).

There did not appear to be clear and consistent differences in the ways the three elements of our data-use framework played out in the higher and lower value-added schools. There were, however, differences that distinguished one lower value-added school from the others. Interpreting this finding, we suggest that three of the schools in our sample, including the two schools identified as higher value added and another identified as lower value-added, seemed to embed their efforts to make data accessible and build capacity for its use into a broader culture of "organizational learning," as described by Firestone and Gonzalez (2007). Leaders in these schools appeared to use positive data cultures to promote an atmosphere of learning that emphasized continuous improvement and a long-term vision shared by teachers and principals. Our fourth case study school, 102, identified through our value-added model as lower value-added, seemed to be mired in a very different context of data use, however; study participants there reported that they often found themselves laboring under the negative effects of an "audit" or "accountability-focused" data culture. Here, data was constructed as being the province of the administration, used to monitor and "embarrass" faculty and hold them accountable. This resulted in a negative, almost caustic, environment, with participants expressing a lack of confidence in performance data, the utility of data collaboration, and the ability of the principal to promote the school's success.

We cannot draw causal conclusions from case-study designs like this one. However, because we did not see consistent differences between the

TABLE 4 Summary Findings by Key Framework Dimensions and School.

Framework Dimension	School 101	School 102	School 103	School 104
Data availability and access	<ul style="list-style-type: none">• Data-rich environment• Data easily accessible	<ul style="list-style-type: none">• Data-rich environment• Data easily accessible• <i>Differences between teachers-principal regarding value of standardized test score data</i>	<ul style="list-style-type: none">• Data-rich environment• Data easily accessible	<ul style="list-style-type: none">• Data-rich environment• Data easily accessible
Data use and capacity for action	<ul style="list-style-type: none">• Data used to structure learning environment:<ul style="list-style-type: none">- student placement- teacher assignment• Data used to guide instruction:<ul style="list-style-type: none">- targeting students- little instructional modification• Data chats to build all teachers' capacity to use data	<ul style="list-style-type: none">• Data used to structure learning environment:<ul style="list-style-type: none">- student placement- teacher assignment• Data used to guide instruction:<ul style="list-style-type: none">- targeting students- little instructional modification• <i>Efforts to build teachers' capacity to use data are not ongoing</i>	<ul style="list-style-type: none">• Data used to structure learning environment:<ul style="list-style-type: none">- student placement- teacher assignment• Data used to guide instruction:<ul style="list-style-type: none">- targeting students- little instructional modification• Data chats to build all teachers' capacity to use data	<ul style="list-style-type: none">• Data used to structure learning environment:<ul style="list-style-type: none">- student placement- Data used to guide instruction:<ul style="list-style-type: none">-targeting students- little instructional modification• <i>Instructional leadership team identifies sample of teachers with whom to build capacity to use data</i>
Cultures of data use	<ul style="list-style-type: none">• <i>Mixed</i> perceptions of data use	<ul style="list-style-type: none">• <i>Negative</i> perceptions of data use	<ul style="list-style-type: none">• <i>Positive</i> perceptions of data use	<ul style="list-style-type: none">• <i>Mixed</i> perceptions of data use

Note. Schools 103 and 104 were identified as higher value added. Differences among schools are italicized.

higher and lower value-added schools, the study suggests that whether a school has had success in improving the achievement scores of low-income, minority, and ELL students may not be related to the types of data available to schools, the ways those data are used, and the data cultures within them. If these conclusions are confirmed in future studies, in other contexts and with other designs, the implication is that policies aimed at building data systems to be used in schools along with teachers' capacity to use them will not be enough to leverage broad-scale improvement.

The findings from our four case-study schools extend our knowledge regarding the ways in which schools engage in data-driven practice and promote functional cultures of data use in four ways. First, the study expands on the work of Firestone and Gonzalez (2007). In particular, it teases apart what these authors refer to as using data as *guidance for action* into two key types, specifying the ways in which educators leverage data to inform the structure of the school's learning environment, on one hand, and to influence instructional practice, on the other.

Second, by looking at the ways data are used to guide the structure of the learning environment and instructional practices separately, our study documented additional uses as well as a proclivity among schools toward some uses over others. In terms of using data to structure the learning environment, schools were employing performance data in the assignment of students to courses and teachers to grade levels and tracks. While understanding whether changes to the structure of the learning environment were "good" or "bad" for students was outside the scope of the study in terms of the data available to us, future projects might consider the extent to which the availability of student-level performance data and schools' proclivity for its use legitimizes and perhaps even expands various forms of ability grouping. On one hand, using performance data to place students into courses might circumvent the subjectivity (and biases) of teacher recommendations. On the other, it may work to solidify tracking systems in high schools and encourage departmentalization in lower grades. Cohen-Vogel (2011) found that three of ten elementary schools studied were experimenting with departmentalized structures, wherein students in grades as low as 2nd rotated to different teachers for math, science, and reading. In two of these three schools, departmentalization was coupled with tracking. According to the author, "at an F school, where student math scores were contributing to a low school grade, the principal had just implemented class-by-class tracking for mathematics instruction in third grade as part of a new supplementary mathematics curriculum" (p. 494).

In their use of data to guide instructional practice, study participants in all four schools were much more likely to report using both internally and externally derived data to guide decisions about which students to target for educational interventions and services (e.g., pull-out help, extended learning opportunities, and tutoring) than for modifying their own classroom instruction. While many teachers, in particular, did report that they used

informal, often formative data to shape their practice, these efforts were described as being individual and non-systematic in nature. This suggests that while data and the performance-based accountability movement in general may have seeped more deeply into “the core technology of schooling” than institutionalists and others who study schools as organizations (e.g., Ogawa, 2009) may have predicted, there appears to be what we here might term “limited data saturation” into schools. That is to say, that even as data—especially, in this case, the externally derived, formal types of data favored under most state accountability frameworks—are being used in and by schools to guide decisions about what is taught and by whom it is taught, they have not as of yet motivated teachers to change their instructional practices. It may also be that teachers are not modifying instruction because they do not know how to do so; the evidence for which instructional practices work best with different types of learners is still relatively limited.

Third, our study expands upon previous research on data cultures (e.g., Petrides & Guiney, 2002; Wohlstetter et al., 2008) by describing actors’ perceptions regarding the benefit of data-driven practices, as well as efforts by schools to foster collaborative data use among members of their faculty.

Finally, we show that consideration of any one of the elements alone—data availability and access, data use and capacity for action, and data cultures—may not be sufficient to understand the patterns of data use in today’s public schools. Instead, the three elements of our framework appear to interact and combine to shape schools into varying data-use environments—“organizations of learning,” on one hand, focused on the use of data to empower new ideas about teaching and learning, or “audit cultures,” on the other, focused on the use of data for evaluation and accountability. Future studies of data use should apply our expanded framework and look more closely at the factors that condition the development of these environments in schools.

NOTES

1. The state’s grading system incorporates various performance indicators, only a small portion of which measure value added. As such, it is possible that our lower value-added schools—as measured by value added to the achievement of three traditionally underperforming subpopulations—may receive high or average grades by the state.

2. Schools were given pseudonyms to protect confidentiality.

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